

Remarks

In view of the final Action of January 3, 2006, and the telephone interview with the Examiner on April 24, 2006, RCE has been filed together with the amendments to the claims.

In particular, claims 1 and 12 have been amended to further define the scope of the claimed invention. Claims 4 and 5 have been editorially amended.

35 U.S.C. § 102(e) - Hashimoto

Claims 1-9, 12 and 13 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,818,109 B2 to Hashimoto et al. ("Hashimoto").

The rejection under § 102(e) is respectfully traversed. For at least the following reasons, the disclosure of Hashimoto does not anticipate Applicants' claimed invention.

There is, *inter alia*, a structural difference between the circuit employed in Hashimoto's sensor and the circuit associated with Applicants' claimed device. See, for example, Hashimoto's Fig. 15, which depicts "an example of the circuit applied to the second nucleic acid detection chip according to the embodiment of the present invention" (Hashimoto, col. 3, lines 20-22).

The difference is the features such that the "third operational amplifier (OP3) . . . is connected via a third resistor (R3) to a device for generating a selectable desired voltage." Hashimoto's circuit has a connection of the third operational amplifier (see element 1607 in Hashimoto's Fig. 15) via a capacitor to the first operational amplifier (see element 1609 in Fig. 15) which is connected to the working electrode (see right side of Fig. 15, i.e., the connection between "Signal" and the voltage source).

Hashimoto discloses in column 15, lines 33 to 45 the following:

The function of each operational amplifier in the circuit of Fig. 15 is as follows:

The operational amplifier 1607 configures a part of the inversion amplifier, and by applying the voltage of $(1 + Z_f/R_f)$ times of e_f (e_f is assumed to mean the potential of point f when the common potential is assumed to be reference here, and it is same as follows) to the counter electrode 1602 e_f is kept constant for e_a (that is, V_{cc}) (Here, Z_f shows electrochemical impedance from counter electrode 1602 to the reference electrode 1603). Since the operational amplifier has the negative feedback, e_a is equal to e_b (potential of common). In the figure, though the common is grounded, it is not unnecessary to ground."

According to the aforementioned disclosure in the setup of Hashimoto, the knowledge of Z_f (electrochemical impedance of counter electrode 1602 to the reference electrode 1603) is required for applying the voltage of $(1 + Z_f/R_f)$ times of e_f . Further, means for measuring Z_f and for generating said voltage are required.

In contract, according to the present invention, there is used a potentiostat having a third operational amplifier (oP3), the inverting input of which is connected via the third resistor (R_3) to a device for generating a selectable desired voltage. The electrochemically relevant potential between the reference electrode and the plurality of working electrodes is proportional to the generated voltage. According to the invention, the constant of proportionality is exclusively dependent from the employed resistors. This makes the generation of the constant of proportionality very robust.

Further, according to the invention, a knowledge of Z_f is not required. The setup according to the invention is not dependent on the electrochemical cell. In setup of Hashimoto, the electrochemical impedance from counter electrode 1602 to the reference electrode 1603 (Z_f) depends on the electrochemical cell and therefore differs from measurement to measurement.

Hashimoto uses a capacitor between the signal and the voltage source (see Fig. 15). In contrast to the setup of Hashimoto, according to the invention, such a capacitor is not provided and would disturb the measurement. According to the invention, the voltage applied to the counter electrode (which is generated by OP3) is not dependent on the current signal. This improves the robustness of the control loop in the setup of the invention.

Since Hashimoto does not describe each limitation of the claimed invention, Hashimoto does not anticipate the invention defined by Applicants' claim 1.

Dependent claims 2-9, each of which depends either directly or indirectly from claim 1, are allowable along with claim 1.

Method claims 12 and 13 are similarly allowable. As indicated above, independent claim 12 has been amended to define in pertinent part a method for electrochemical detection that includes

c) simultaneously applying a predetermined voltage profile which is variable during the measurement between the working electrodes (AE1, AE2, AE3) and the reference electrode (RE),

while regulating said voltage between the working electrodes (AE1, AE2, AE3) and the reference electrode (RE) with a potentiostat (P) for generating a predetermined voltage profile which is variable during the measurement between the working electrodes (AE1, AE2, AE3) and the reference electrode (RE), said potentiostat (P) comprising a second

operational amplifier (OP2) and a second resistor (R2), and a third operational amplifier (OP3) and a third resistor (R3), with the third operational amplifier (OP3), to whose output the counterelectrode (GE) is connected and whose inverting input (OP3-) is connected via the second resistor (R2) to the output of the second operational amplifier (OP2), being connected via the third resistor (R3) to a device for generating a selectable desired voltage, with the noninverting input (OP3+) of the third operational amplifier (OP3) being grounded,

For reasons analogous to those presented above with respect to the allowability of Applicants' apparatus claims 1-9, the disclosure of Hashimoto does not anticipate the method defined by Applicants' claims 12 and 13.

Hashimoto fails to disclose Applicants' claimed method of detection that includes "c) simultaneously applying a predetermined voltage profile which is variable during the measurement between the working electrodes (AE1, AE2, AE3) and the reference electrode (RE), while regulating said voltage between the working electrodes (AE1, AE2, AE3) and the reference electrode (RE) with a potentiostat (P) for generating a predetermined voltage profile which is variable during the measurement between the working electrodes (AE1, AE2, AE3) and the reference electrode (RE), said potentiostat (P) comprising a second operational amplifier (OP2) and a second resistor (R2), and a third operational amplifier (OP3) and a third resistor (R3), with the third operational amplifier (OP3), to whose output the counterelectrode (GE) is connected and whose inverting input (OP3-) is connected via the second resistor (R2) to the output of the second operational amplifier (OP2), being connected via the third resistor (R3) to a device for generating a selectable desired voltage, with the noninverting input (OP3+) of the third operational amplifier (OP3) being grounded," and "d)

measuring the currents flowing through the working electrodes (AE1, AE2, AE3), all of the working electrodes (AE1, AE2, AE3) being held at the same potential during the measurement."

For at least the above reasons, reconsideration and withdrawal of the rejection of claims 1-9, 12 and 13 under § 102(e) are respectfully requested.

35 U.S.C. § 103(a) - Hashimoto in view of Blades and Ho

Claim 11 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Hashimoto in view of U.S. Patent No. 5,260,663 to Blades and U.S. Patent No. 4,488,556 to Ho. The Office Action relies upon Blades and Ho since "Hashimoto does not mention providing a capacitance in between the output of the third operational amplifier and the inverting input" (Office Action page 13).

The rejection of claim 11 under § 103(a) is respectfully traversed.

First, there is no suggestion or motivation in any of Hashimoto or Blades or Ho that would have led one to select the references and combine them in a way that would produce the invention defined by claim 11. Blades and Ho may disclose the use of a capacitance, but there is no suggestion in any of the references that would have led one to combine their teachings with the other references so as to arrive at Applicants' claimed device.

Furthermore, for all of the reasons indicated above with respect to the rejection under § 102(e), Hashimoto differs structurally from Applicants' claimed device. Claim 1, therefore, from which claim 11 depends, is allowable.

And, even if the references were combined as asserted in the Office Action, they would not result in Applicants' claimed invention. Hashimoto is different from Applicants' claimed device. Blades and Ho may disclose the use of a capacitance, but add nothing that would rectify the above-described structural deficiency of Hashimoto.

Thus, the asserted combination fails to suggest Applicants' claimed device in which "a capacitance is connected between the output of the third operational amplifier (OP3) and the inverting input (OP3-) thereof."

For at least the above reasons, reconsideration and withdrawal of the rejection of claim 11 under § 103(a) are respectfully requested.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance.

Reconsideration and allowance are earnestly solicited.

One month extension of time is hereby requested. A credit card authorization form in the amount of \$455.00 is attached herewith for filing RCE (\$395.00) and one month extension of time (\$60.00)

Respectfully submitted,

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